Identification and Estimation 1

08:30-10:30  Chair : Harada Hiroshi(Kumamoto Univ.)
Room : C204  Co-Chair : Park Pu Kyun (POSTECH)

08:30 – 08:50  I-TA05-1
Identification of System from Generalized Orthogonal
Basis Function Expansions
Chul-Min BAE, Kiyoshi WADA
(Kyushu Univ.)

In this paper, we will expand and generalize the orthogonal
functions as basis functions for dynamical system
representations. The orthogonal functions can be considered
as generalizations of, for example, the pulse functions,
Lagrueer functions, and Kautz functions, and give rise to an
alternative series expansion of rational transfer functions. It
is shown how we can exploit these generalized basis
functions to increase the speed of convergence in a series
expansion. The set of Kautz functions is discussed in detail
and, using the power-series equivalence, the truncation error
is obtained. And so we will present the influence of noises to
use Kautz function on the identification accuracy.

08:50 – 09:10  I-TA05-2
Identification of Polymerization Reactor Using Third
Order Volterra Kernel Model
Motoki NUMATA, Hiroshi KASHIWAGI, Hiroshi HARADA
(Kumamoto Univ.)

It is known that Volterra kernel model can represent a wide
variety of nonlinear chemical processes. But almost all
Volterra kernel models which appeared in the literature are up
to second order, because it was difficult to measure higher
order Volterra kernels. Kashiwagi has recently shown a
method for measuring Volterra kernels up to third order using
pseudorandom M-sequence signals. In this paper, the authors
verified the applicability of this method for chemical processes
using polymerization reactor simulation. Also, the authors
have recently proposed a practical identification method for
chemical processes, which is based on the combination of off-
line nonlinear identification and on-line linear identification.
This method is also applied to the identification of
polymerization reactor, and we obtained ...

09:10 – 09:30  I-TA05-3
Identification of Volterra Kernels of Nonlinear Van de
Vusse Reactor
Hiroshi KASHIWAGI, Li RONG
(Kumamoto Univ.)

Van de Vusse reactor is known as a highly nonlinear
chemical process and has been considered by a number of
researchers as a benchmark problem for nonlinear chemical
process. Various identification methods for nonlinear system
are also verified by applying these methods to Van de Vusse
reactor. From the point of view of identification, only the
Volterra kernel of second order has been obtained until now.
In this paper, the authors show that Volterra kernels of
nonlinear Van de Vusse reactor of up to third order are
obtained by use of M-sequence correlation method. A
pseudo-random M-sequence is applied to Van de Vusse
reactor as an input and its output is measured. Taking the
crosscorrelation function between the input and the output,
we obtain up to 3rd order Volterra kernels, which is ...

09:30 – 09:50  I-TA05-4
New observer design for Linear Systems with Unknown
Inputs : Dynamic UIO
Chan-Hoi Kim and Jong-Koo Park
(Sungkyunkwan Univ.)

This paper proposes a dynamic observer that is applicable to
linear time-invariant systems subject to unknown inputs. The
proposed method utilizes the output feedback control structure
to design an unknown input observer. We name it as the
dynamic unknown input observer(UIO). The dynamic UIO can
be designed easily compared to the usual static UIO, and the
system response could be improved.

09:50 – 10:10  I-TA05-5
A New Convolutional Weighting Function Method for
Continuous-time Parameter Identification
Hyun Seob Choi and PooGyeon Park
(Pohang Univ.)

This paper proposes a new approach to identifying the
unknown parameters of continuous LTI systems. For
parameter identification in continuous-time systems, the
Linear Integral Filter (LIF) method generally has been used in
the beginning. Especially, one of the most efficient LIF
methods in the literature is to use a weighting function
satisfying specific three constraints. In high order systems,
even though the weighting function satisfies the three
constraints, it is impossible to identify the exact parameters
of the systems because of information loss arising from a
great amount of magnitude differences among the weighting
function and its high-order derivatives. This paper, using an
LMI technique, shows the limitation in designing the
weighting function of the existing methods, and ...

10:10 – 10:30  I-TA05-6
Self-Structuring Radial-Basis Function Network for
Identification of Uncertain Nonlinear Systems
Jae-Choon Jun, Jang-Hyun Park, Pil-Sang Yoon, Gwi-Tae Park
(Korea Univ.)

In this paper we introduce a new algorithm that enables radial-
basis function network(RBFN) to be structured automatically
and guarantees the stability of the RBFN. Because this new
algorithm is efficient and also have the advantage of fast
computational speed we adopt this algorithm as on-line
learning scheme for uncertain nonlinear dynamical systems.
Based on the fact that a 3-layered RBFN can represent a
specific nonlinear function reasonably well by linearly
combining a set of nonlinear and localized basis functions, we
show that this RBFN can identify the nonlinear system very
well without knowing the information of the system in advance.